Weibull++ Example 1 - Complete and Right Censored Data Analysis

Download Example File for Version 10 (*.rsgz10) or Version 9 (*.rsr9)

Watch the video on ReliaSoft.TV

Background

Ten identical units are reliability tested at the same application and operation stress levels for 120 hours. The objective is to use the complete and right censored data from the test to determine the unreliability for a mission duration of 226 hours, and the warranty time for a reliability of 85%.

Experiment and Data

Six of the units fail during the test after operating for the following numbers of hours: 16, 34, 53, 75 and 93. Five other units are still operating (i.e., right censored or suspended) after 120 hours.

Analysis

Step 1: Using Weibull++, the first step is to create a standard folio for non-grouped times-to-failure (in hours) with suspensions data, as shown next.

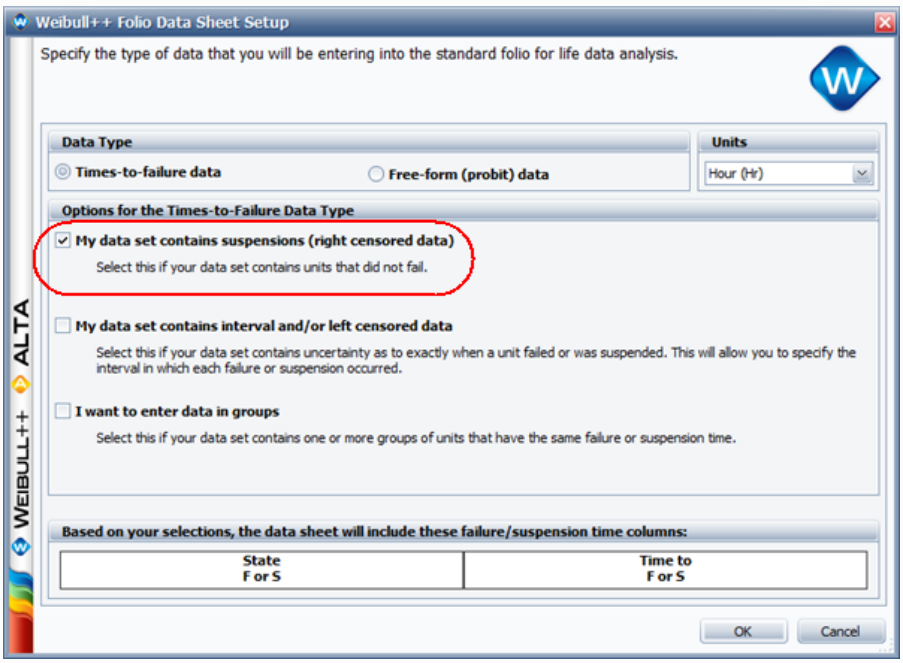

Figure 1: Data Sheet Setup window.

Step 2: Once the folio is created, the next step is to enter the data in the standard folio. The data sheet contains a "State F or S" column to indicate whether each data point represents a failure (F) or suspension (S). (When entering data, the user can type an F or S into this column for each data point or use the following shortcut provided by Weibull++: positive time values entered into this column are automatically marked as failures and negative values are marked as suspensions.)

The data set is then analyzed using the 2-parameter Weibull distribution and rank regression on X. The results are displayed next.

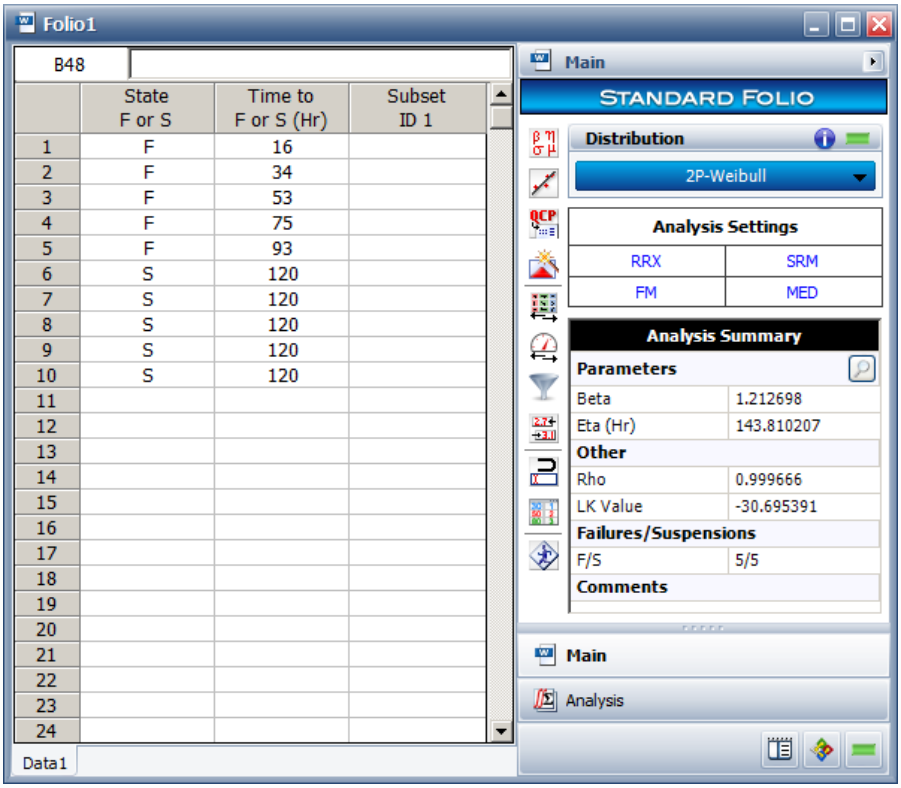

Figure 2: Standard folio with data and results.

Step 3: Once the parameters for the data are calculated, several methods were used to find the solution to this case. The first, and more laborious, method is to extract the information directly from a probability plot within Weibull++.

Click the line on the plot. A crosshair shows the current location on the line. You can move the mouse pointer to track the coordinates from any position on the line. The example below shows that at about 226 hours, the unreliability (probability of failure) is estimated to be roughly 82%. Click the plot again to return to normal mode.

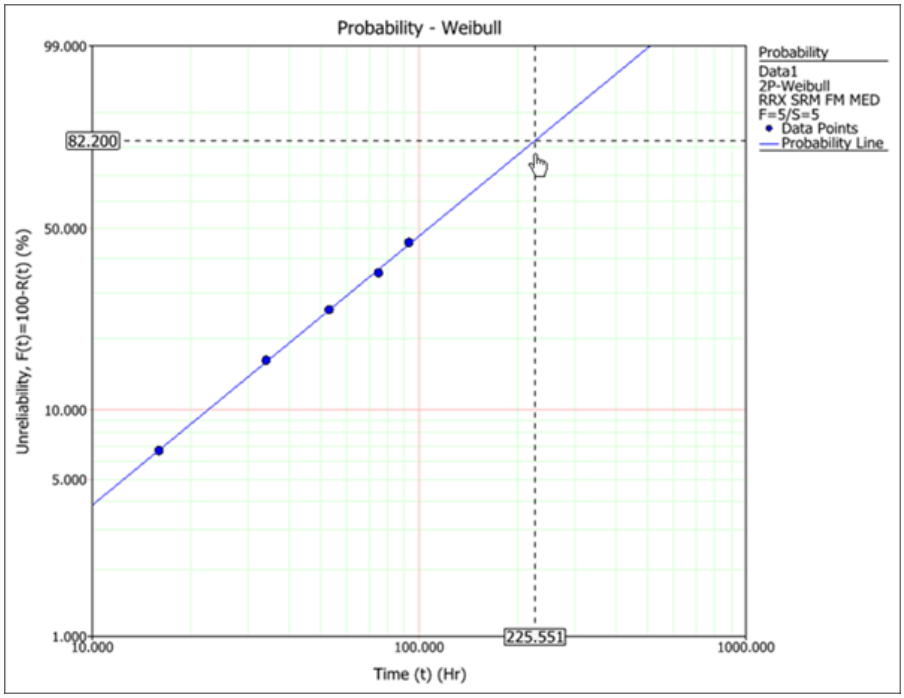

Figure 3: Using a plot to estimate the unreliability at 226 hours.

Step 4: The second method used to determine the unreliability involves using the Quick Calculation Pad (QCP). The following figure shows the probability of failure calculated with the QCP, which agrees with the result found using the probability plot.

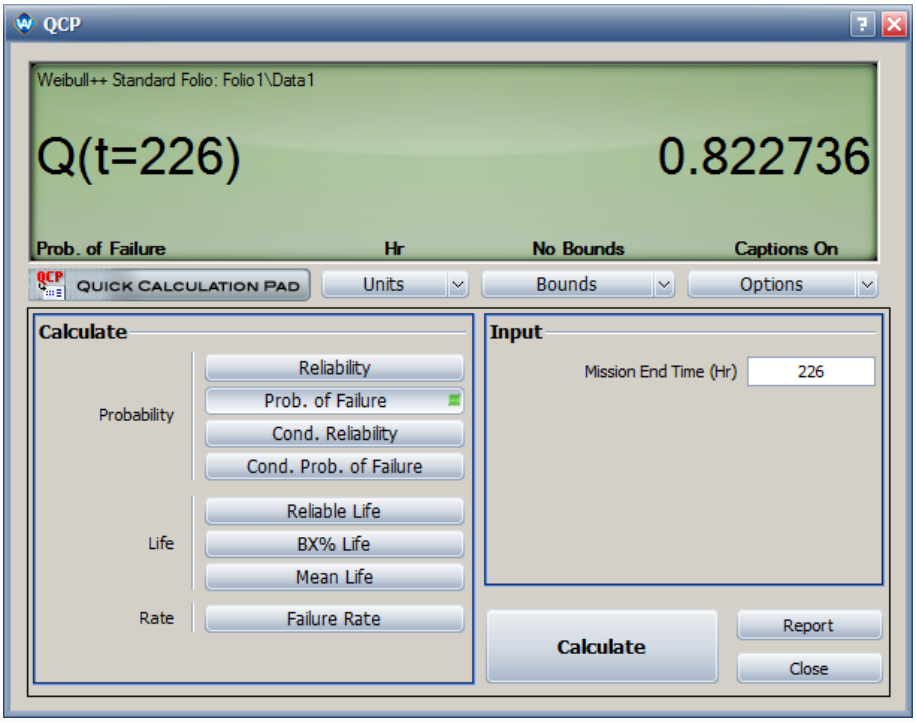

Figure 4: Solving for unreliability at 226 hours.

The next figure shows how the QCP can also be used to determine a warranty time of 32.1437 hours for a reliability of 85%.

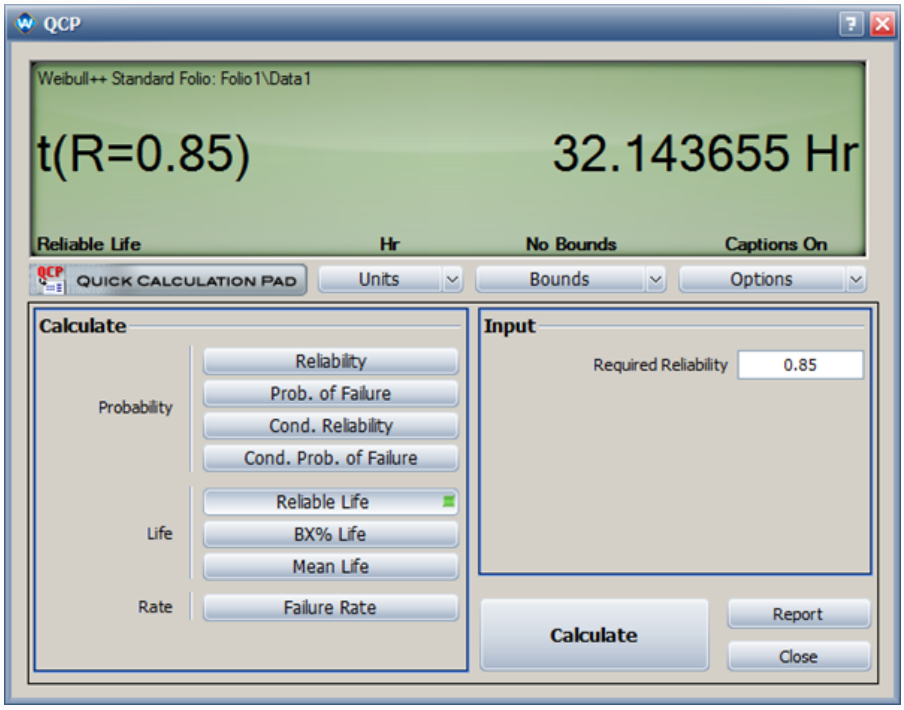

Figure 5: Solving for the time at which reliability is 85%.